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A RATIONALE FOR STUDIES IN THE CONTROL OF EPIDEMIC INFLUENZA[1]

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THAT a lectureship established to perpetuate the influence of an illustrious anatomist should risk contamination by the nebula of influenza is of itself sufficient evidence that he instilled a spirit of broadmindedness and extension into borderline fields. In the study of infectious diseases the usual emphasis is upon the body fluids, while too little attention is directed to the cellular disturbances. Or too little thought is given to interpretation of those disturbances when they are observed. It becomes increasingly apparent, with the viruses particularly, that typical pathological lesions represent injuries induced because of a preference of the invader for certain physiological conditions or because a cell type possesses attributes which selectively attract the infectious agent. The physiology of infection—its pathogenesis—reveals more and more clearly that the purpose of preventive measures is to prevent that union or to modify its effect. This is well illustrated in the problem of influenza.

The recognition that epidemic influenza is a virus disease has constituted a notable advance, but a clarification of all the problems involved has not been accomplished. In fact, there is still confusion in terminology and a diversity of opinion as to what should be included under the diagnosis of influenza. Some tend to include all unidentified respiratory dis-

[1] The Annual Clarence M. Jackson Lecture, sponsored by Phi Beta Pi Fraternity, University of Minnesota Medical School. Delivered October 21, 1942.

ease in the term, adding a greater load than even the much-abused influenza can rightfully bear. There are others who speak of pandemic influenza as something apart and continue to use it in the unjustified sense of severity rather than distribution. "Sporadic" influenza is employed carelessly despite the fact that the last ten years have yielded little evidence of sporadic distribution of the known viruses of influenza. In this discussion influenza will be considered an epidemic disease which occurs at frequent intervals in the same geographic areas, spreads rapidly, subsides promptly and varies remarkably in extent and severity in different years. An attempt will be made to interpret the problem of prevention in the light of evidence gleaned from studies with viruses which have been identified, utilizing this information to establish a rationale for the various approaches directed toward the protection of a susceptible population.

In the control of epidemic diseases chance observation and empirical analogy have been widely followed. The student of a disease, however, seeks by utilizing knowledge of the physiology of the infection to orient efforts toward the most effective site at which to interrupt the sequence of infection. In order to do so major attention must be given to the manner in which infection is induced and the mechanisms by which immunity is effected.

The Pathogenesis of Influenza

The reservoir of epidemic influenza is not established. There is, however, considerable evidence that it may be in circulation in some part of the world at all times. The possibility of carriers has not been eliminated. Nor has a reservoir for human infection similar to that of the lungworm and earthworm demonstrated by Shope in swine influenza been explored. It is clear, therefore, that until further information concerning this aspect is available we are forced to combat the disease as it erupts.

Influenza spreads through a population by the transfer of virus from the respiratory tract of the infected individual to that of a susceptible. In the majority of instances the process is a direct infection, although indirect transfer through contamination is obviously possible. There is little reason to consider the disease air-borne except when in crowded quarters the differentiation between direct transfer and impregnation of the air becomes academic. When virus of influenza gains entrance to the respiratory tract of the susceptible it selectively attacks and destroys the ciliated columnar epithelium. These cells are superficially situated, not intimately bathed in the fluids of the blood stream, and apparently protected to a great extent by their own mechanisms, such as mucous secretions and ciliary action. Following the necrosis of the attacked cells exudate is poured out and the supporting tissues give evidence of acute, edematous, inflammatory changes. These changes are essentially limited to the nose and the larger respiratory passages.

The pneumonia commonly seen in experimental animals is not a necessary accompaniment of the invasion. In fact, during the early passages in which the virus is becoming adapted to ferrets or mice, pulmonary lesions are not observed, although virus is abundantly present. And it is clear that in the human population pneumonia is present in only a minority of the patients. It seems probable that involvement of the pulmonary tissue is a phenomenon secondary to the destruction of bronchial epithelium in which interstitial swelling, peribronchial infiltration and the outpouring of serous fluid and mononuclear cells represent the major change. The necrotic process observed in the respiratory epithelium is not detected in the alveolar walls.

In the absence of invasion by way of the respiratory tract influenza virus does not produce the lesions. From the lungs of mice which have been given the virus intraperitoneally one can recover large amounts of virus without any evidence of pneumonia. When relatively immense doses of the virus are given by the abdominal route, however, the mice may develop fatal pulmonary disease. It seems likely that the result is due to an overflow of virus into the upper respiratory tract whence it proceeds to cause pulmonary disease by the usual sequence observed after the intranasal inoculation while virus present on the vascular side of the alveolar wall fails to produce disease by failing to reach the susceptible epithelium.

There is little evidence, despite the extensive constitutional symptoms, that influenza is a generalized infection. One might wonder whether the severe myalgias represent damage to the neuromuscular system. While the virus has been demonstrated in the blood of mice for short intervals and after special conditions of inoculation, it has not been recovered from the blood of patients. Furthermore, no significant pathological changes have been recognized in organs other than those of the respiratory tract. The conclusion appears justifiable, therefore, that influenza represents in its pathogenesis a specific injury inflicted by a virus of sharply selective affinities upon a specialized type of cell lining the respiratory tract and that to obtain resistance these cells representing the portal of entry must be afforded protection.

Protection may be conferred by procedures which prevent the virus from reaching the susceptible individual or by procedures which alter the reactivity of the individual so as to render him resistant to the

harmful effects of the infectious agent when it arrives. The latter is usually implied in the term, immunity.

IMMUNITY

What evidence is there that a state of immunity to influenza can be achieved? It has long been said that immunity to influenza is either short-lived or non-existent. It has even been stated that one attack renders an individual more susceptible to subsequent exposures. Statements based upon clinical criteria tend to be inaccurate because of insufficient observation or unwillingness to adopt even those diagnostic criteria which become apparent to the seasoned observer. Owing to the fact that until recently it had not been possible to consider the diagnosis etiologically it is obvious that the question can not be answered on the basis of previous epidemiological data. What appeared to be the same disease clinically or epidemiologically might prove to be entirely different immunologically. Nevertheless, it had been generally accepted that immunity to influenza does exist, that it lasts for a period of some months, at least, but rarely over a long period of years. The tendency for influenza to occur most frequently in children also suggests that resistance increases after that period. Moreover, there is ample evidence that every one exposed, even intimately, in the course of an epidemic does not take sick. The need for such data based upon etiological studies is evident and offers a fruitful field for extended investigation.

At present two distinct types of influenza virus can be identified. The first, originally described by Smith, Andrewes and Laidlaw and confirmed in our laboratory, has been called Type A. This virus has been found to be the causative agent in the outbreaks of 1932–33, 1934–35, 1936–37, 1938–39 and 1940–41. The other, Type B, isolated in 1940 in our laboratory and independently by Magill, was shown also to have been responsible for the wide-spread epidemic of 1936. The disease caused by them has been recognized only in epidemic forms. Each has been implicated in extremely mild and moderately severe epidemics. The two types of virus are similar in that they produce diseases in man and animals which are epidemiologically, clinically and pathologically similar. Magill and Kendall have observed individuals who in successive attacks of influenza had been infected with influenza A and influenza B, respectively. Immunologically, they are so different that infection with Type A virus does not elicit antibodies to Type B virus; immunity to one affords no resistance to the other; nor do serological reactions reveal any evidence of a basic relationship between the two. It is not improbable that still further immunological types will be detected. Until then it seems unwise to test the sales resistance of the physician by the use of terms of misleading accuracy, such as influenza Y.

Beyond the differences in types there is variation in strains of virus belonging to the same type. Some of these differ sharply from others and under specified conditions it can be demonstrated that resistance to one strain of Type A may not give complete protection against another. What role the differences play in epidemic recurrence is not yet established, but the lack of homogeneity observed among strains isolated during different epidemic years indicates that they may be of definite significance. In any case the distribution of multiple types and divergent strains constitutes an inherent difficulty in establishing immunity to the presently unpredictable recurrences of influenza. Fortunately, however, it appears that the basic pattern of pathogenesis and resistance is the same for all the variants so that, apart from their serological behavior, they can be considered as a pathogenic unit.

Most of the accurate information concerning immunity to influenza virus has been obtained from study of the experimental disease. In animals susceptible to the virus, immunity can be induced readily. Vaccination of mice by the intraperitoneal route results in the development of antibodies and immunity without producing infection; subcutaneous vaccination is ordinarily not as effective. The degree of immunity in mice is measured by the survival of the animals and the absence of pulmonary lesions. In the ferret, however, more rigid conditions can be imposed. In addition to the criteria applied to mice, the occurrence of fever, lassitude and nasal signs can be recorded. Vaccination of the ferret does not usually give complete resistance; intranasal test may cause fever and signs of nasal injury. Judging from survival and the absence of pulmonary lesions, however, the vaccinated ferret appears as resistant as vaccinated mice.

Recovery from even mild infection is accompanied by complete immunity. But this resistance wanes so that after a few months the previously infected ferret behaves like the one which had been vaccinated. Antibodies persist, but the respiratory epithelium destroyed by the primary infection has returned to anatomic normalcy and with that return has again become susceptible to infection. Immunity tests are followed by fever and the other milder features of the disease but pneumonia does not occur. Following the second infection the antibody titer rises to a much higher level than that attained as a result of the primary infection and the animal is once more immune.

It is of interest, however, to note that by repeated intranasal doses of small amounts of the infectious

agent at short intervals after an original mild disease it is possible to maintain a state of complete resistance in ferrets without significantly affecting the level of antibodies. There is evidence, moreover, to indicate that the normally susceptible epithelium itself has been modified so that as a result of repeated stimuli it has developed a functional resistance independent of antibodies in the circulating blood. These facts have been briefly recounted in order to furnish a background for the various directions which may be taken in attempting to prevent influenza in man.

ACTIVE IMMUNIZATION

Let us first consider the induction of specific immunity. Preventive specific immunity is related in most minds to the action of specific antibodies in the blood, actively acquired through vaccination, or through subclinical infection with a modified virus; passively conferred by the parenteral administration of antibodies. The thesis which I propose is this: In order to function most effectively specific antibodies must be available to prevent the virus from attacking the cells to which it is specifically attracted. When the agent must be transmitted by way of the blood to reach its site of localization, circulating antibodies can exert their greatest effect. When, however, the portal of entry is superficial and also constitutes the area of primary injury it is apparent that antibodies can prevent disease only if they are immediately present in that area.

It has been uniformly observed that a high percentage of patients who develop influenza have antibodies in the blood at the time of onset. Since in the majority of such instances the titers are relatively low it has been the tendency to conclude that resistance is proportionate to the antibody level. The experiments of Smorodintseff *et al.*, Burnet, and Stokes and Henle were based upon experimental infection of human subjects. They, too, state that a relationship between susceptibility and antibody titers exists. Since vaccination of human subjects with influenza virus in the active or inactive state is followed by a sharp increase in circulating antibodies it has been assumed that resistance might be increased proportionately. This is the basis on which most vaccinating efforts have been projected but concerning which little explanation has been offered as to how the supposed result is accomplished. On the other hand is the evidence from experimental animals that vaccinated or previously infected animals may not be immune to the homologous virus and that the respiratory epithelium may be destroyed even though antibodies are present in the blood. How, then, can circulating antibodies prevent the pathogenic influence of the virus on these superficial cells?

In seeking information concerning the question our attention was directed to a consideration of factors which might be available in the environment of the vulnerable tissue. A study of the nasal secretions of human subjects revealed in them a substance capable of inactivating influenza virus. This substance has the characteristics of antibody both in its immunological and physico-chemical properties. It is present at birth, lost rapidly thereafter but beyond two years of age the frequency of its presence increases so that by school age it is present in a high proportion of human nasal secretions. It makes its appearance or increases in amount as a result of infection with the virus. In comparison with titers of neutralizing antibodies of the blood the substance is present in low concentration but in general those individuals with high levels of circulating antibodies have the more potent nasal secretions.

It was of interest to determine then whether subcutaneous vaccination exerted any influence upon the inactivating capacity of nasal secretions. A series of experiments was conducted last spring in which, before and after vaccination with influenza virus, both the blood and nasal secretions of a group of subjects were tested for their neutralizing capacity. It was found in those patients in whom a sharp response of humoral antibodies was observed, that the inactivating capacity of the nasal secretions was also enhanced.

The results suggest, therefore, that subcutaneous vaccination serves as a preventive by its influence upon the local protective mechanism which offers a more effective physiological defense than antibodies in the blood themselves. This concept attributes to circulating antibodies a secondary role of limiting the spread of the virus. After the virus has become established and engorgement and serous discharge takes place they may prevent the infection of other cells, as in the experimental animal they contribute to the prevention of pulmonary involvement by virtue of the lung's high vascularity. In the presence of an epidemic with marked incidence of pneumonia due to the virus that effect might result in a marked limitation of severity and mortality without comparable influence upon the incidence of infection. The experiments of Stokes and Henle, previously referred to, suggest that this was their major result.

While it is obviously a simple matter to stimulate circulating antibodies in man, it is much more difficult to demonstrate that immunity results from the procedure. A summary of evidence obtained with one form of vaccine has been recently presented by Horsfall. In these groups vaccine which was said to induce unusually high yields of antibody reduced the incidence of the disease by one third at most; in some groups no effect was discerned. The studies are still

in their primitive stage and there may be too great conservatism as to the nature of vaccinating material. As has been seen, however, there is more than a traditional basis for indicating the possibilities.

A second method adaptable to preventive use is the creation of active immunity by infection with modified virus or the setting up of subclinical infection. It represents the principle involved in the virus vaccines which have been most successfully utilized in human disease—smallpox, rabies, yellow fever. The application to influenza is readily seen. Introduction of influenza virus by routes other than the respiratory does not produce the disease. This has been demonstrated by the fact that human subjects given the fully active virus subcutaneously or intramuscularly do not give evidence of infection. In general, immunity resulting from infection by the natural route is a firmer immunity than that derived from vaccination by abnormal routes. The reasons are that under the former conditions the naturally susceptible cells are affected by the virus and receive the benefit of that stimulation while the systemic defenses also are subjected to the antigenic stimulus. The inoculation of active influenza virus into the respiratory tract would afford an opportunity for the respiratory epithelium to participate in the reaction. The possibility of initiating an epidemic is immediately put forward as an objection. Smorodintseff *et al.*, Burnet, and Stokes and Henle have, with the use of recently isolated strains of virus, caused frank disease of considerable severity. However, in the past few years, using the PR8 strain cultivated in tissue culture or fertile eggs, we have demonstrated that the virus can be sprayed into the nostrils or introduced by packs soaked in virus, without producing clinical disease. In fact, the difficulty has been that the virus has been too greatly attenuated and results as measured by the development of circulating antibodies have been irregular. It may be, of course, that the response in terms of circulating antibodies is not a proper measure of the effect and that the influence upon the respiratory epithelium is much greater than the systemic evidence would indicate. This remains to be shown.

There is additional theoretical reason for suggesting the advantage of subclinical infection. In the fields of both plant and animal viruses it has been shown that the inoculation of an attenuated or mild strain of infectious agent will protect the host against a highly virulent strain given at the same time or shortly thereafter. This protection has been called interference, connoting that the mild virus competes successfully with the lethal strain for the privilege of occupying the susceptible cells, and is not based upon rapidly developing serological activities. Intranasal vaccination with the attenuated culture strain in the face of an outbreak might very well exert a similar influence.

There is need for further systematic exploration of vaccination by the intranasal route. *A priori* it presents a more rational and simpler opportunity than inoculations made by para-respiratory routes.

PASSIVE IMMUNIZATION

Turning from the question of active immunization it is of interest to consider the possibilities of conferring specific protection by means of passive transfer of antibody to the threatened individual. Since many subjects possess circulating antibodies at the time of illness, it is clear that to influence resistance by intravenous or intramuscular administration of serum would require relatively large concentrations of immune substances. Early in experimental studies when efforts were being made to develop technics for the measuring of antibody titers it became clear that serum given intraperitoneally was much less effective in preventing intranasal infection than when serum and virus were mixed and given by the intranasal route. This was further demonstrated by the studies by Laidlaw, Smith, Andrewes and Dunkin using the serum of immunized horses. Smorodintseff and Shiskhina reported for the first time in 1938 the observation that when immune serum was given intranasally before the virus infection and even for a period thereafter it was much more effective in protecting mice than the same serum given in much larger doses by other routes. Since then Stokes and his associates, Taylor, Hare and others, have adequately confirmed the results. In 1938 Nechaev published the results of the use of intranasal sprays of immune serum as a therapeutic agent in man. According to his statements, where given intranasally to patients in the first two days of illness, the serum was of definite therapeutic value. The following year Smorodintseff reported prophylactic studies on 650 men—again with favorable results. These were amplified by Smorodintseff, Gulmow and Tshalkwa, who reported that prophylactic administration reduced the incidence of influenza in 501 treated individuals to 8 per 1,000 while in 1,825 untreated an incidence of 82 per 1,000 was observed.

Recognizing the fact that the protective value of serum so administered is a temporary expedient it, nevertheless, may be found of considerable value in otherwise unprotected populations faced with an epidemic. The results all emphasize again the primary need of protecting the respiratory cells and the greater efficacy of immune substances available at the portal of entry. The addition of antibodies to the surface of susceptible cells by the use of immune serum is essentially a heightening of the virus-in-

activating capacity of the nasal secretions. Thus, local passive immunity, selectively applied, provides general immunity by breaking the infectious chain at the site of localization of the virus.

BARRIERS

Protection may be more than enabling an individual to combat an infectious agent which reaches him, but may represent, on the contrary, the use of agencies which have no immunological meaning. They do not give the susceptible individual resistance but serve to interrupt the passage of infectious material from the infected to the susceptible individual. The practices of isolation, quarantine and disinfection represent efforts in that direction. The first attempted, by limiting the quarters and associations of the sick individual, to decrease the opportunities for distribution; the second, quarantine, by curtailing the movements of a patient and his associates during a period in which disease might be incubating, has sought to limit the spread. The limitations in application are to a great extent those imposed by practical considerations of inability to restrain an individual sufficiently long to eliminate his participation as a spender of infection —as with streptococcicosis. Disinfection meant in many respects fumigation. It became apparent that disinfection of the premises had little effect when the human subject served as the chief distributor. Gradually, terminal disinfection was largely discontinued. Recently, however, it has reappeared under different guises intended for constant disinfection of the atmosphere.

The problem of the control of infections transmitted by way of the respiratory tract has been of increasing concern to pediatricians in charge of children's wards and institutions. The knowledge of the efficacy of ultraviolet light in killing bacteria and viruses suggested the application to nurseries, wards and schools. Under these conditions recent reports have attempted to create an erythematous opinion. While it is apparent that sterilization of the air may proceed, radiation has been most effective in small spaces in which motion is at a minimum and ventilation rigidly controlled. In fact, recent evidence indicates that satisfactory results are obtained only when the air is brought directly to the lamp. Moreover, some of the evidence is weighted by dissimilarity between control and test groups. Briefly, its application rests primarily on the assumption that air-borne dissemination is the important mode of spread of these diseases. In limited spaces with controlled ventilation and heavy contamination this may be true, but under normal conditions of activity, with open windows or outdoor associations, the probabilities of general control by ultraviolet irradiation can scarcely be anticipated.

Of greater promise because of simplicity is the use of aerosols. In the early days of the present conflict, French and British investigators drew attention to efforts toward air sterilization in bombproof shelters, barracks and hospital wards. Due again to their proven bactericidal properties, synthetic detergents in various vehicles were used for sprays. Decrease in the bacterial content of the air was accomplished, but various disturbances such as dust interfere with their efficacy. It was further noted that certain fumes, such as incense, were even more effective than aerosols. The next step was introduced by Robertson and his associates, who recognized that propylene glycol, which had been used merely as a base, was more effective than the agents mixed with it. It is readily volatile, requires no expensive equipment for its distribution, acts apparently in the gaseous phase rather than by changing surface tension and is active in high dilutions against pathogenic bacteria and viruses. At present there is excellent reason to believe that this non-toxic agent will fulfill a valuable function indoors but the out-of-doors is not readily subject to similar control. Disinfection revived is claiming important attention.

And now the lowly mask, after progressive decline and discard, has been dusted off, remodeled and shown by accurate physical measurements to fulfill a real function in preventing a ready distribution of minute particles of infected material. The ordinary gauze mask is not only *not* beneficial but actually harmful. The revised masks containing flannel filters which fit properly are shown to prevent deflection of infectious particles and to filter them out of the air; they become more efficient with use and laundering; they provide protection to the wearer and to the exposed susceptible. The new mask deserves place in the field of prevention.

Still another barrier is being earnestly sought—a drug which may be taken prophylactically and be available so as to render the arriving virus inert. Or, if rapidly effective, it may be employed so early after infection as to abort the incipient disease. Although this is anticipation, in view of rapid progress in the field of chemotherapy the period of waiting may be terminated at almost any time.

SUMMARY

Influenza has long been a field conducive to fancy and speculation. At present, however, through increasing knowledge of the pathogenesis of the disease and the factors influencing resistance, the collected

data are beginning to take form. In this discussion an effort has been made to point out the trends, to interpret their possibilities on the basis of the mechanisms involved, and to give some intimation as to their relative applicabilities and limitations. It is clear that certain of them offer reasonable promise of exerting a real effect in the prevention of influenza; it remains only to prove them.

OBITUARY

FRANK DAWSON ADAMS

ON December 29, 1942, Dr. Frank Dawson Adams died at his home, 1173 Mountain Street, Montreal. Dr. Adams was one of Canada's foremost men of science and one of her most distinguished citizens.

Born in Montreal, in September, 1859, he was educated at the Montreal High School and McGill University. Choosing geology as his major subject of study, a science then just coming into its own in Canada, he graduated with first rank honors in natural science in 1878, when only nineteen years of age. He subsequently studied at Yale University, Johns Hopkins and finally at Heidelberg. From the latter university he received his Ph.D. degree "summa cum laude" in 1892. From McGill he received the doctor of science degree in 1902 for distinction in science and later the LL.D. degree for distinguished public service.

His first appointment was in 1880 to the staff of the Canadian Geological Survey. He was appointed lecturer in geology at McGill in 1889 and Logan professor of geology in 1893. He was last but one of those who, receiving their inspiration from the late Sir William Dawson, by far the greatest principal McGill has had, was appointed to the staff of McGill by Sir William, whom he ultimately succeeded as head of the department of geology. During the succeeding years he arose step by step to merit almost every distinction which a man of science can hope to attain.

In Canada, Toronto, Queen's, Bishop's and Mount Allison Universities similarly honored him with the LL.D. He was early elected fellow of the Royal Society of Canada and later became its president. In Britain he was elected a fellow of the Royal Society of London and also of the Geological Society of London. By the latter society he was awarded the Wollaston Gold Medal, the greatest distinction the society has to offer. It was characteristic of him that when he received the cable telling him of the award, he first thought it was a mistake and that it must be meant for some one who happened to have the same name as himself.

He was equally recognized outside of Canada and the British Empire. He received honorary degrees from a number of American universities and had the unique distinction of being the only Canadian foreign associate member of the American Academy of Science. He was also elected foreign member of the Swedish Academy of Science, honorary member of the Mineralogical Society of Russia, of the Geological Society of Belgium and of many other scientific societies of equal distinction in other foreign countries. The International Geological Society elected him its president in 1913. The Geological Society of America elected him to a similar honor in 1918.

In Canada every effort to utilize more fully our economic resources received his loyal and hearty support. He was an active member of the Canadian Conservation Commission in the days when it was an active force in Canada and before political manipulation put it out of business. From the foundation of the National Research Council until his retirement from the university he was an active and distinguished member of that body and for a short time its executive chairman.

As a geologist he ranked first among his profession in Canada. For years a constant stream of papers came from his pen, covering almost every phase of Canadian geology. These appeared in the publications of the leading scientific journals in America and Britain, dealing with natural science problems. Altogether approximately ninety papers so appeared. From this long list it is difficult to select what might be considered most important. Perhaps the papers which gave him the greatest satisfaction were: "The Transfusion of Matter from one Solid to Another under the Influence of Heat"; "An Experimental Investigation in the Flow of Marble" (with J. T. Nicolson); "Experimental Investigation of the Compressibility and Plastic Deformation of Certain Rocks" (with Ernest C. Coker); "Experimental Work on the Flow of Rocks"; "An Experimental Contribution to the Question of the Depth of the Zone of Flow in the Earth's Crust"; "On the Origin and Nature of Ore Deposits—an Historical Study"; "On the Amount of Internal Friction Developed in Rocks during Deformation, and of the Relative Plasticity of Different Types of Rocks" (with J. A. Bancroft).

These researches, extending over a number of years, dealing with the flow of rocks under changing conditions of temperature and pressure, carried on with the support of the Carnegie Foundation, remain a permanent contribution to our knowledge of the manner in which internal changes in the structure of the earth were brought about in geological time. They were

remarkable both because of the mechanical ingenuity involved in the study and for the results obtained.

His last contribution to science, "The Birth and Development of the Geological Sciences," is the one in which he doubtless took the greatest pride. It will without question remain a standard work on the subject for many generations. To find the material he visited all the great libraries of Europe and America where information was to be found. For this purpose he collected a splendid library on the history of the physical sciences. Just a few weeks before his death he completed the cataloguing of this library and handed it to McGill University, a splendid gift, in some ways unique, which cost many thousands of dollars.

His studies, however, had a much wider range than Canada. He traveled widely. Everywhere he went geology was his major interest. For example, after his retirement, on a trip around the world he visited Ceylon, and his study of "The Geology of Ceylon," published in the *Canadian Journal of Research,* is a major contribution to that subject and was an important factor in stimulating the Geological Survey of India to intensify its activities.

Just a word about the man—modest but not retiring he had a zeal for knowledge that was unremitting; kindly and considerate in his relation with others, he was nevertheless firm in his purpose to accomplish the task in hand. Because of these qualities and his strong sense of justice and fair play he won the respect and good will and confidence of both the students of his faculty and the professors and instructors. He was one of a small group responsible for the establishment of a graduate faculty at McGill and was its first chairman. As dean of the faculty of applied science and later as vice-principal and for a time acting principal, he showed the same qualities in administration as he had shown in his scientific work.

It was my good fortune to be associated with him in various ways for the past fifty years. Although the activities of my life led me far afield we always maintained a close and affectionate friendship. I worked with him on the Conservation Commission, on the National Research Council and in many religious and social activities. He was with me as assistant director of the Khaki University overseas during World War I. In my fifty years of association with university work I know of no one who seemed so completely to have found and maintained that balance of kindness of heart and firmness of purpose which was especially characteristic of him. He had a great gift of friendship—the value of which I richly experienced. He had a deep sense of the value of the religious life. While holding firmly to his own views, he was broad-minded and tolerant of those who differed from him. He lived the doctrine of human brotherhood.

H. M. TORY

AMIN FAHD MALUF PASHA

MAJOR-GENERAL AMIN FAHD MALUF PASHA, B.A., M.D. (American University of Beirût), formerly principal medical officer of the Iraq Army, died at his home in Heliopolis, Egypt, on January 21, in his seventy-first year, after a prolonged illness. He began his career in military medicine as an officer in the Egyptian Army and served a few years in the Sudan. Upon the Arabian Revolt in the last war, he resigned his position in the Egyptian Army and joined King Feisal's troops as a surgeon. He was decorated ten times. Toward the end of the war he nearly succumbed to an attack of typhus. He was elevated from colonelcy and created a Pasha on his retirement about fifteen years ago. He was much interested in the structure and habits of animals. His latest works are "An Arabic Zoological Dictionary" (Cairo: Al-Muktataf Press, 1932, 271 pp.) and "An Astronomical Glossary" (Cairo: Egyptian Library Press, 1935, 142 pp.). He was held in high regard by his colleagues and acquaintances notwithstanding the reserve and forthrightness which so often characterizes a soldier who cheats death several times and who dedicates his bachelor life to the state.

N. S. R. MALUF

RECENT DEATHS

DR. EDWIN B. TWITMYER, professor of psychology at the University of Pennsylvania, director of the Psychological Laboratory and Clinic, died on March 3 at the age of sixty-nine years. He had been a member of the faculty of the university for forty-six years.

DR. FRANK STURDY SINNATT, director of the Fuel Research Station of the British Department of Scientific and Industrial Research, died on January 27 at the age of sixty-two years.

THE death is announced in Indo-China of Dr. Alexandre Emile John Yersin, a director of the Pasteur Institute in Paris. He was sixty years old. Dr. Yersin established the first colonial Pasteur Institute at Nha Nang, Annam, and later was appointed inspector general of all four institutes in that area. The other three institutes are in Saigon, Hanoi and Dalat. He also founded a branch institute under the auspices of the Chinese government at Canton.

PROFESSOR A. K. CAJANDER, three times Prime Minister of Finland, died on January 21 at the age of sixty-four years. He was the leading Finnish forestry expert. From 1904 to 1911 he was lecturer in botany at Helsinki University, and in 1911 he became professor of forestry. He was also director-general of the State Board of Forestry.

SCIENTIFIC EVENTS

THE NUFFIELD FOUNDATION

LORD NUFFIELD has authorized the following announcement which is printed in *The Times,* London.

Lord Nuffield has intimated his intention of founding forthwith a charitable trust, which will be known as "The Nuffield Foundation."

He desires to make this donation from resources which have been built up through private enterprise, in the essential importance of which he is a firm believer. He wishes, in so doing, to record his view that the spontaneous contributions which come from such sources to the service of the community are, and must always remain, a vital factor in the life of the nation.

Lord Nuffield will, therefore, hand over to trustees his shareholdings in the Nuffield Organization to the value of £10,000,000 as a capital fund. The income from this fund will be administered by managing trustees, who will not exceed seven in number. He has appointed the following as managing trustees:

Sir William M. Goodenough (chairman).
Sir John S. B. Stopford, F.R.S. (vice-chairman).
Professor F. L. Engledow, B.Sc.
The Hon. Geoffrey C. Gibbs.
Sir Hector Hetherington.
Sir Henry T. Tizzard, F.R.S.
Miss Janet Vaughan.

Lord Nuffield wishes to make it clear that in carrying out this arrangement he is not in any way withdrawing from his association with his businesses, with which he will be personally identified in the same way as heretofore.

The objects which the trustees will endeavor to assist are as follows:

1. Medical research and teaching.
2. The organization and development of medical and health services.
3. Scientific research and teaching in the interests of trade and industry.
4. The pursuit of social studies.
5. The care and comfort of aged persons.

The normal scope of the trust's activities will be Great Britain and Northern Ireland. Attention may, however, be given to projects particularly affecting the Empire, and in regard to items 1 and 3 above the provision of scholarships and other assistance for Empire students is included. It is provided that Lord Nuffield's trusts which are already in being may benefit from the income of the new trust.

The managing trustees are enjoined to consult the appropriate Ministers or Departments of State in connection with any matters of major importance in which they may become interested. They are not, however, to be in any way bound by the views expressed by these ministers or departments in carrying out the work of the trust.

THE WORK OF SOVIET ASTRONOMERS AT LENINGRAD DURING THE SIEGE[1]

THE Soviet Scientists' Antifascist Committee has sent a report dealing with the work carried on by Leningrad astronomers during the time of the siege of the city by the Germans to the American Association of Scientific Workers. It was prepared by Lydia Bach, of Moscow. It reads:

Professor I. D. Jongolovich, head of the Leningrad branch of the Institute of Astronomy of the Academy of Sciences of the U.S.S.R., has come by plane to Moscow for a few days and told us of the activities of Leningrad's astronomers. Last winter, when scientific research institutes were being evacuated from Leningrad, we were also urged to leave our embattled city in order to continue our astronomic research in the quiet of the Soviet rear. However, sixteen of us decided to remain in Leningrad and go on with our astronomic observations despite the stress of the blockade.

The Leningrad Astronomic Institute has issued a series of astronomic almanacs for geodetic workers, navigators and pilots. The "Astronomic Almanac" for 1943 contains extensive information on changes of the position of the sun, the moon, planets and stars in the course of the year. The information is rendered with the exactitude demanded by the work of large observatories as well as for astronomic and geodetic measurements. At the beginning of the war the Soviet "Astronomic Almanac" was considerably expanded so that it now fully replaces almanacs issued abroad. The matrices of the "Astronomic Almanac of USSR" for 1943 were brought to Moscow by plane from Leningrad to be published by the Academy of Sciences of the USSR.

The "Nautical Astronomic Almanac" for 1943 contains data from the "Astronomic Almanac of USSR" in the form necessary for navigation in all the seas and oceans. The "Aviation Astronomic Almanac" is a guide to pilots which is particularly important for long-distance flights.

At present, simultaneously with its other activities, the Leningrad branch of the Institute of Astronomy has already begun to prepare data and tables for the Almanacs for 1944.

GRANTS FOR RESEARCH IN TUBERCULOSIS

THE Committee on Medical Research of the National Tuberculosis Association has recommended to the board of directors of the association that the following researches be aided with grants from the

[1] Transmitted via radio to the American Association of Scientific Workers by Sergei Pilipchuk, Secretary of the Soviet Scientists' Antifascist Committee, February 12, 1943.

association, effective from July 1, 1943, to June 30, 1944.

"Chemistry of the tubercle bacillus," under the direction of Professor R. J. Anderson, Sterling Chemistry Laboratory, Yale University.

"Chemistry of tuberculin and serum studies of tuberculosis," under the direction of Dr. Florence B. Seibert, Henry Phipps Institute, University of Pennsylvania.

"Enzymes as factors in resistance to tuberculosis," under the direction of Dr. M. C. Winternitz and Dr. Bruno Gerstl, Laboratory of Pathology, Yale University.

"Relationship of diabetes to tuberculosis," under the direction of Dr. M. M. Steinbach, Department of Bacteriology, Columbia University.

"Correlation of x-ray and tuberculin diagnostic studies," under the direction of E. B. Fred *et al.*, University of Wisconsin.

"Improvement in x-ray technique," under the direction of Professor Charles Weyl, Moore School X-ray Laboratory, University of Pennsylvania.

"Development of a virulence test," under the direction of Dr. C. E. Woodruff, Wm. H. Maybury Sanatorium, Northville, Michigan.

"Recovery of T. B. fractions in the urine, a possible activity test," under the direction of Dr. John R. Paul, School of Medicine, Yale University.

"Clinical study and follow-up of babies to adolescence," under the direction of Dr. Edith M. Lincoln, Bellevue Hospital, New York City.

"Influence of war and industrial changes on tuberculosis," under the direction of Dr. Carroll E. Palmer and Dr. Herman E. Hilleboe, of the U. S. Public Health Service.

"Course and prognosis of the minimal lesion in tuberculosis," under the direction of Dr. Carroll E. Palmer and Dr. Herman E. Hilleboe, of the U. S. Public Health Service, and others.

"Development of an organization to evaluate chemotherapeutic agents in tuberculosis," under the direction of a special committee.

The members of the Committee on Medical Research are Dr. Charles J. Hatfield, Dr. Kendall Emerson, Dr. Charles A. Doane, Dr. Leroy U. Gardner, Dr. Esmond R. Long, Dr. Karl F. Meyer, Dr. Florence R. Sabin, Dr. David T. Smith, Dr. H. S. Willis, Dr. Julius L. Wilson and Dr. Wm. Charles White, *chairman*.

THE SCIENCE TALENT SEARCH[1]

FORTY boys and girls, all graduating seniors in public, private and parochial schools, have been selected in the second nation-wide science talent search just concluded at Washington to receive science scholarships amounting to $11,000.

One boy and one girl each received a Westinghouse Science Grand Scholarship of $2,400, and eight others received Westinghouse Science Scholarships of $400 each. The grand scholarships were awarded to Raymond Reinhart Schiff, 16, of New Rochelle, N. Y., and Gloria Indus Lauer, 17, of Ames, Iowa.

Additional one-year scholarships of $100 each were awarded to 30 seniors who also attended the Science Talent Search Institute from February 26 through March 2 in Washington.

Each of the ten top scholarships is for four years and all the scholarships may be used in study at any college or university that the student desires to attend, if the school he chooses shall meet the requirements of the scholarship awarding committee. If the student enters military or other government service, his scholarship will be held in trust by Science Service for his use after the war, or until such time as he is in a position to accept it.

The second annual Science Talent Search began last November when some 25,000 school principals and teachers were asked to cooperate in finding the graduating seniors—both boys and girls—who appeared most likely to succeed as scientists. About 15,000 students who entered the search were given a science aptitude examination administered by their school officials.

Each entrant who completed the aptitude examination—about 3,400—was asked to write an original essay on "Science's Next Great Step Ahead"; the essay, together with scholarship and personal records, was submitted to the Science Talent Search board of judges by the school officials of the entrant.

The aptitude examination was specially prepared for the Science Talent Search by Dr. Harold A. Edgerton, director of the Occupational Opportunities Service of the Ohio State University, and Dr. Steuart Henderson Britt, director of the Office of Psychological Personnel of the National Research Council and professor of psychology at George Washington University. The aptitude examination was designated to test powers of observation and deduction, rather than knowledge of science.

On the basis of the scholarship and personal records, the essays and the science aptitude examination, students were chosen as delegates to the Institute of the Science Talent Search. During sessions of the institute, the forty young delegates—29 boys and 11 girls—were interviewed by the judges and given final examinations. On the basis of the interviews and examinations, the scholarships were awarded.

Dr. Edgerton and Dr. Britt, with Dr. Harlow Shapley, director of Harvard College Observatory, constituted the scholarship awarding committee.

Speakers at the institute, who followed the general theme of "Science's Next Great Step Ahead," included Dr. Shapley; Dr. Hugh S. Taylor, professor of chemistry, Princeton University; Dr. Eleanor

[1] Telegram from C. N. Fry, Westinghouse Electric and Manufacturing Company.

Bliss, the Johns Hopkins University School of Medicine; Père Artheme Dutilly, missionary-scientist of the Oblate Missions and the Catholic University of America; Dr. Edwin G. Conklin, president, American Philosophical Society, and also president of Science Service; Dr. H. L. Dryden, president, Institute of the Aeronautical Sciences, and Dr. Marshall H. Stone, president, American Mathematical Society.

The Science Talent Search is conducted annually by the Science Clubs of America, sponsored by Science Service, and the Westinghouse Electric and Manufacturing Company. The Westinghouse Company provides the scholarships as an inspiration to scientific achievement in America.

The eight young scholars who received $400 Westinghouse Science Scholarships were: Charles Poultney Perot, 17, Lancaster, Pa.; Thomas Richard Quermann, 17, Clarksburg, W. Va.; Josiah Macy, Jr., 17, Warrenton, Va.; Donald Rosswell Harris, 17, Johnstown, Pa.; William Weidman Piper, 17, Columbus, Ohio; Henry Hiram Kohl, 16, Newburgh, N. Y.; Elizabeth Ann Lean, 17, Shorewood, Wis.; and Virginia Ellen March, 16, Madison, Wis.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE election of officers for 1943 was delayed because of cancellation of the New York meeting. By a mail ballot of the council, a procedure that is valid under the constitution of the association, the following were elected. It was necessary to take a second ballot for president, since no person received a majority vote.

VICE-PRESIDENTS OF SECTIONS

Mathematics (Section A): F. D. Murnaghan, the Johns Hopkins University.

Physics (Section B): J. W. Beams, the University of Virginia.

Chemistry (Section C): Arthur J. Hill, Yale University.

Astronomy (Section D): Otto Struve, Yerkes Observatory.

Geology and Geography (Section E): John K. Wright, American Geographical Society.

Zoological Sciences (Section F): Carl R. Moore, the University of Chicago.

Botanical Sciences (Section G): W. J. Robbins, the New York Botanical Garden.

Anthropology (Section H): Robert H. Lowie, the University of California.

Psychology (Section I): Herbert Woodrow, the University of Illinois.

Social and Economic Sciences (Section K): F. Stuart Chapin, the University of Minnesota.

Historical and Philological Sciences (Section L): Henry E. Sigerist, the Johns Hopkins University.

Engineering (Section M): Thorndike Saville, New York University.

Medical Sciences (Section N): Paul D. Lamson, Vanderbilt University.

Agriculture (Section O): R. E. Buchanan, Iowa State College.

Education (Section Q): Harold F. Clark, Columbia University.

MEMBERS OF THE EXECUTIVE COMMITTEE

J. McKeen Cattell, editor of SCIENCE, Lancaster, Pa.

Burton E. Livingston, professor emeritus, the Johns Hopkins University.

Kirtley F. Mather, Harvard University.

ELECTED MEMBERS OF THE COUNCIL

Lawrence K. Frank, National Resources Planning Board, Washington, D. C.

Paul C. Kitchin, the Ohio State University.

In accordance with the constitution, the following section committeemen were elected by the respective sections for a four-year term expiring at the close of the meeting of December–January, 1946–1947:

Mathematics: G. Baley Price, University of Kansas.

Physics: Elmer Hutchisson, 35 W. 57th St., New York, N. Y.

Chemistry: R. M. Burns, Bell Telephone Laboratories.

Astronomy: Jason J. Nassau, Case School of Applied Science.

Geology and Geography: Ralph H. Brown, University of Minnesota.

Zoological Sciences: Clarence L. Turner, Northwestern University.

Botanical Sciences: Walter F. Loehwing, University of Iowa.

Anthropology: Julian H. Steward, Bureau of American Ethnology, Smithsonian Institution.

Psychology: H. E. Burtt, the Ohio State University.

Social and Economic Sciences: Frederick F. Stephan, War Manpower Commission, Washington, D. C.

Historical and Philological Sciences: Conway Zirkle, University of Pennsylvania.

Medical Sciences: Dallas B. Phemister, University of Chicago.

Agriculture: Emil Truog, University of Wisconsin.

Education: Edward S. Evenden, Columbia University.

SCIENTIFIC NOTES AND NEWS

THE Vaughan Research Award in Horticulture for the best paper presented before the American Society for Horticultural Science and published in its *Proceedings* in 1942 has been made in the field of vegetable crops to Dr. O. A. Lorenz and Dr. J. E. Knott, of the University of California at Davis, for their paper entitled "Studies of Graywall of Tomato," which appeared in Volume 40. This award of $500

is made through the generosity of Leonard H. Vaughan, of the Vaughan Seed Stores, Chicago. Preference is given to papers that present new discoveries and which show promise of commercial importance in practical application.

THE managers of the Royal Institution have awarded the Actonian Prize of 100 guineas for the year 1942 to Dr. Alexander W. G. Ewing and Mrs. Ewing for their investigation concerning deafness and hearing aids.

THE Council of the British Geological Society announces the following awards: The Wollaston Medal to Professor A. E. Fersman; the Murchison Medal to Professor A. Brammall; the Lyell Medal to D. N. Wadia, lately of the Geological Survey of India; the Bigsby Medal to Dr. G. M. Lees, chief geologist of the Anglo-Iranian Oil Company; the Wollaston Fund to Miss Ethel D. Currie; the Murchison Fund to A. G. Davis; one moiety of the Lyell Fund to F. A. Bannister and another moiety to M. H. Hey.

AT a recent meeting of the Council of the Society of Chemical Industry, London, the award of honorary membership was conferred on Dr. Harold Hibbert, E. B. Eddy professor of industrial and cellulose chemistry at McGill University. In his absence the scroll was received in his behalf by the Canadian High Commissioner, the Right Honorable Vincent Massey. In making the award the president said that "the council in deciding to bestow this honor selected with great care one they considered worthy, for his career illustrates to a remarkable degree the great influence which a man of high scientific attainments can exert on industry and on the well-being of the community."

DR. JOSEPH L. WILLIAMS, associate professor of biology and chemistry at Lincoln University, Pennsylvania, has been elected a fellow of the Royal Entomological Society of London.

R. V. SOUTHWELL, rector of the Imperial College of Science and Technology, formerly fellow of Brasenose College and professor of engineering science at the University of Oxford, has been elected to an honorary fellowship at Brasenose College.

ROY B. WHITE, president of the Baltimore and Ohio Railroad, has been elected chairman of the Board of Trustees of the Maryland Academy of Sciences. He succeeds Herbert A. Wagner, chairman of the Consolidated Gas Electric Light and Power Company of Baltimore. Mr. Wagner was named honorary chairman of the academy.

AT a business meeting of the Botanical Society of America, held in the Biological Laboratories of Harvard University on February 8, new officers were elected and members appointed on special committees. The newly elected president is Dr. William J. Robbins, director of the New York Botanical Garden. Professor George S. Avery, Jr., Connecticut College, was elected vice-president. Professor Arthur J. Eames was reelected a member of the editorial board of the *American Journal of Botany*, the official journal of the society. The newly appointed representatives of the society on the council of the American Association for the Advancement of Science are Dr. P. W. Zimmermann and Dr. F. D. Kern. Members of the Committee on Nomenclature, the Committee on Botanical Teaching and the Emergency War Committee were reappointed for another year.

DR. C. E. MCCLUNG, professor of zoology emeritus of the University of Pennsylvania, has been appointed to act as chairman of the department of zoology at Swarthmore College during the absence of Professor Laurence Irving, who has been commissioned Major in the Army Air Corps and ordered to the Air Forces Proving Ground Command, Elgin Field, Florida. Professor Robert K. Enders has also been instructed to report for military service. Dr. C. Brooke Worth was commissioned in the Medical Corps several months ago. Other members of the department who will soon leave for military service are Dr. P. F. Scholander, George A. Edwards, Lloyd Merritts and Henry Mahler.

THE Zoological Society of Philadelphia announces the appointment of Dr. David L. Coffin, instructor in veterinary pathology at the University of Pennsylvania, to the Herbert Fox memorial fellowship in comparative pathology. Dr. Coffin will serve as assistant to Dr. Herbert L. Ratcliffe, who is the newly appointed director of the Penrose Research Laboratory of the Zoological Society of Philadelphia, and also as assistant professor of comparative pathology at the University of Pennsylvania. Thus, a long-established practice of joint staff appointments between two well-known Philadelphia institutions will be continued. This fellowship, established in 1942 in memory of Dr. Herbert Fox, pathologist and director of the Penrose Research Laboratory from 1907 to 1942 and professor of comparative pathology at the University of Pennsylvania from 1927 to 1942, provides for half-time work at the Zoological Garden by faculty members of the School of Veterinary Medicine of the university who are interested in the diseases of wild animals.

Museum News states that Manuel Urrutia, director of the National Museum of Hygiene, Mexico City, at the suggestion of the Pan American Sanitary Bureau, has become an interne for three months at the Cleveland Health Museum.

G. K. HICKIN, formerly with Merck and Company, Inc., recently has been appointed head of chemical

engineering design for the B. F. Goodrich Company, Akron, Ohio.

DR. ALEXANDER L. BASSIN, assistant professor of orthopedic surgery at the Yale School of Medicine and associate surgeon (orthopedist-in-chief) of the New Haven Hospital, reported on March 1 for active duty at St. Albans, L. I., as a Lieutenant Commander in the Medical Corps of the Navy.

DR. WILLIAM F. DILLER, assistant professor of zoology at the University of Pennsylvania, has been commissioned a first lieutenant in the United States Army.

ALEXANDER B. KLOTS, of the department of biology of the College of the City of New York and of the department of entomology of the American Museum of Natural History, has been commissioned a captain in the Sanitary Corps and is stationed at Camp Joseph T. Robinson, Arkansas.

AT Iowa State College the following members of the faculty have leave of absence to permit them to take commissions in the food and nutrition section of the sanitary corps of the United States Army: Captain H. L. Wilcke, head of poultry husbandry; Captain A. L. Anderson, associate professor of animal husbandry, and Lieutenant W. J. Shannon, assistant professor of chemistry.

DEAN ALBERT B. NEWMAN, of the School of Technology of the College of the City of New York, has been appointed regional representative of the War Man-Power Commission for New York State. He will act in an advisory capacity to the war-training programs in this area, which include projects of the National Youth Administration, the U. S. Office of Education and private industry.

The Times, London, reports that R. A. McCance, who is an authority on the chemical composition of foods and nutrition, is making a lecture tour of Spain and Portugal, arranged by the British Council. He is to speak in Portugal on "The Physiology of Infancy" and in Spain on "Progress and Problems in Mineral Nutrition."

DR. E. G. GERWE, until recently director of laboratories of the William S. Merrell Company, of Cincinnati, joined the staff of E. R. Squibb and Sons, New York, on February 1. He is in charge of the control divisions of the pharmaceutical and chemical manufacturing laboratories of the Squibb plants in Brooklyn and New Brunswick, N. J.

DR. CHARLES PUTNAM SYMONDS, Air Commodore in the Royal Air Force, consultant in neurology, delivered on March 10, 11 and 12 at 5 o'clock at the Harvard Medical School a series of Edward K. Dunham Lectures for the promotion of the medical sciences. His subject was "The Human Response to Flying Stress."

DR. HENRY NORRIS RUSSELL, professor of astronomy at Princeton University, delivered a public lecture at the University of California at Los Angeles on March 3. The lecture, entitled "Science Looks at God," was given under the auspices of the University Committee on Lectures, Music and Drama.

DR. C. E. MARSHALL, professor of soils at the University of Missouri, lectured at Iowa State College on February 24 and 25. He spoke on "The Chemical Environment of the Plant in the Soil" and on "Some Electrochemical Properties of Membranes and Their Relationship to Problems of Biology and Agriculture."

DR. KARL PAUL LINK, professor of biochemistry at the University of Wisconsin, delivered on February 25 the Edward C. Lee Memorial Lecture in Chemistry in the Kent Chemical Laboratory of the University of Chicago. His address was entitled "From the Haystack to the Clinic via Coumarin Chemistry."

THE initiation of new members into the Smith Chapter of the Society of the Sigma Xi will take place on Thursday, March 18. The initiation will be preceded by a business meeting of the chapter, and will be followed by a dinner and public lecture. The lecturer will be Professor George Wald, of the Biological Laboratories of Harvard University, who will speak on "The Evolution of Vision and the A Vitamins."

SIR STAFFORD CRIPPS, British Minister of Aircraft Production, was the principal speaker in a discussion on the organization of science in war-time at a conference held on January 30 by the British Association of Scientific Workers. Sir Laurence Bragg was one of the speakers in a discussion on scientific planning, which took place on the following day.

THE twenty-second annual conference of the North Central States Entomologists will meet at Purdue University on March 25 and 26. The program will deal with insect problems of the Armed Forces, Priority Chemicals and Insecticide Substitutes, and Protection of Crops and Animals Essential to the War Effort. The Central Plant Board will meet at Purdue on the two preceding days, the Extension Entomologists on the twenty-fourth, followed by the Chinch Bug Conference in the evening.

THE Medical College of Virginia, Richmond, will sponsor a symposium on nutrition which will be held on March 25, 26 and 27. Addresses will be given by Dr. J. C. Funk, director of health education, State Health Department, on "Nutrition Activities of the State Department of Health," and by Dr. W. H. Sebrell, of the National Institute of Health, on "Nu-

trition in a Changing World." The following day a series of papers on various aspects of nutrition is planned. There will be a dinner at 7 P.M., at which Dr. V. P. Sydenstricker, of the University of Georgia, will give an address on "War-time Nutrition in England." On Saturday morning a panel discussion will be led by Dr. Lydia J. Roberts, of the University of Chicago, on "Teaching Nutrition Material to Elementary School Children."

THE Society of Rheology and the Polytechnic Institute of Brooklyn will hold a joint research conference on "The Present State of the Kinetic Theory of Rubber Elasticity" on Saturday, April 3, at 10:30 A.M. at the institute. The program includes a paper by Dr. M. L. Huggins, of the Eastman Kodak Company Research Laboratory, Rochester, N. Y., on "Statistical Treatment of Long Chain Molecules," and by W. L. Wood, of the National Bureau of Standards, on "The Present Experimental Aspect of Rubber Elasticity." These papers will be discussed by authorities in the subjects.

THE Executive Board of the American Public Health Association announces that the association will sponsor a three-day Wartime Public Health Conference in New York City on October 12, 13 and 14. The seventy-second annual business meeting of the association will be held in connection with it. The program will be devoted exclusively to wartime emergency problems as they affect public health and the public health profession.

ACCORDING to the *Journal* of the American Medical Association the research prize of $500 of the American Urological Association will not be awarded this year and plans for the June meeting in St. Louis have been cancelled. The American Association for the Study of Goiter has postponed all meetings for the duration of the war. All officers will hold their positions until the next meeting of the association. The 1943 session of the American College of Chest Physicians has been cancelled.

The Times, London, reports that at a meeting of the Royal College of Surgeons of England, Dr. J. Newman Morris conveyed a message of greetings from the Royal Australasian College of Surgeons. In return the president handed to him, as a token of friendship to the sister college, a First Edition (1664) of Willis's Anatomy, the illustrations of which are by Sir Christopher Wren.

DISCUSSION

THE FUNDAMENTALS OF SALMON CONSERVATION[1]

THE conservation of the salmon fisheries is a matter of momentous importance in view of a promise of a real food shortage in the not too distant future. In addition to this we owe it to posterity to preserve the anadromous fishes since it is through these fishes that the vast oceanic plankton is in part made available, which is otherwise unavailable as food for man.

The most efficient conservation methods can be developed only through an understanding of the fundamental factors affecting the migratory movements of these fishes.

It has now been shown that salmon and certain other fishes do respond to a carbon dioxide tension gradient.[2,3,4] That there is more than a probability that there is a carbon dioxide tension gradient from the spawning streams to the oceanic feeding grounds has been demonstrated.[5] Powers and Clark[4] have shown that the brook trout and the rainbow trout not only respond to very slight carbon dioxide tension gradients but that these fishes respond to the carbon dioxide tension gradient through receptors located in the lateral line organs.

It now remains to put the culminating tests to the salmon themselves. This can be done by two simple methods. First, the gradient tank technique can be employed to determine the capacity of the adult salmon, with and without lateral line nerves bilaterally sectioned just distal to the gills, to respond to very slight carbon dioxide tension gradients. Second, as in the past homeward bound salmon could be tagged and liberated. The lateral line nerves could be bilaterally sectioned just distal to the gills of one out of each two salmon tagged. If the salmon do find their way back to their home stream through a response to a carbon dioxide tension gradient through receptors located in the lateral line organs, the salmon with lateral line nerves bilaterally sectioned should be less apt to find their home stream than those with their lateral line nerves intact. The only complicating factor that might be involved would be the gregarious habits of the salmon. Even then those with lateral line nerves bilaterally sectioned should be less apt to find schools and in turn would be more apt to be lost from schools than those with lateral line nerves intact.

Since the author will most likely never be permitted to carry out these tests himself, he is publishing these suggestions in the hope that these tests will be made

[1] Contribution No. 10, Department of Zoology and Entomology, University of Tennessee, Knoxville.

[2] V. E. Shelford and E. B. Powers, *Biol. Bull.*, 28: 315, 1915.

[3] E. B. Powers, *Publ. Puget Sound Biol. Sta.*, 22: 1, 1921.

[4] E. B. Powers and R. T. Clark, *Ecology*, 24: 100, 1943.

[5] E. B. Powers, *Ecology*, 22: 1, 1941.

by workers now in the field since there is a minimum of additional expense and effort involved.

EDWIN B. POWERS

UNIVERSITY OF TENNESSEE,
KNOXVILLE

A PLEA

THIS is a plea from one who likes, occasionally, to run as he reads. In wartime censorship is vital. In the days of 1918 "somewhere in France" became a familiar figure of speech. But the knowledge concealed by the title of a scientific paper such as "The Genus *Oochoristica* Lühe 1898" conceals nothing of value except from the wistful seeker after knowledge. Only after a study of such an article is he delighted or disappointed to learn that the aforesaid *Oochoristica* is taxonomic sanctuary for "forty-five valid species of tapeworms parasitic as adults in reptiles and mammals." This title confusion is being slowly clarified, but there is another which is much worse.

I have just read that a certain copepod in which I was interested was taken in two hauls, one in 11° 18′N, 78° 34′W, and the second 6° 32′N, 80° 04′W, but only detailed search through a footnote or time-consuming labor with an atlas and a pair of dividers reveals the important fact that the hauls were made in different oceans.

I have often wondered whether I am alone in abyssal ignorance of the relative positions of such localities as 40° 33′N, 74°W, and 40° 33′S, 74° E, or whether there are others who are grateful for the trouble I have always taken in adding to 39° 15′N, 72°W and 2° 59′N, 78° 11′W, the sub-titles, 125 miles S E of New York City, and Gorgona Island, Colombia, respectively.

WILLIAM BEEBE

NEW YORK ZOOLOGICAL SOCIETY

RUSSIAN NAMES

IN SCIENCE of February 19, p. 178, Professor Neugebauer gives a useful list of recent contributions to pure mathematics in Russia. This list could and should be extended to other contributions of value, printed periodically in the "Doklady" of the Soviet Academy. They are in excellent English (or French), and relate to physics, chemistry and all branches of natural history. However, the direct object of these few words is to call attention to the need of a definite rule in the transliteration of the Russian names. The faults in the list given in this respect are not those of the referent, but they are faults nevertheless and should be avoided in our publications.

The rules are simple enough. There is no "w" in the Russian alphabet, but only "v"; the letters "f" or "ff" never in Russian end a name, the terminal consonant being invariably "v"; and the "tsh" or "tch" is generally "č," with the exact sound of the "ch" in "cherry." As it is, the terminal "v" in the names quoted is given four times correctly, five times as "w" and four times as "ff"; while the "č" (now written thus not only in the Slavic languages but also in the German and occasionally even in the English) is given in most cases as the clumsy "tsh" or "tch."

As the use of the Russian names by American scientists may well be expected to go on increasing, it would seem only sensible to adapt definite and correct rules for their transliteration, even if the errors should come from Russia itself or from the authors. The latter I found endeavor often to conform to what seem to be the wishes of their English-speaking colleagues.

A. HRDLIČKA

SMITHSONIAN INSTITUTION,
WASHINGTON, D. C.

SPECIAL CORRESPONDENCE

THE WAR MANPOWER SITUATION IN PHYSICS

THIS statement should be read in connection with the item entitled "Suggestions from the Office of Scientific Personnel of the National Research Council" which appeared in the January 1 number of SCIENCE and which called attention to the need for recruiting teachers of physics from the ranks of other departments or from other sources. Only in this way can bidding among institutions be prevented, which would make more difficult the meeting of the shortage. In each department there must be a nucleus of regular teachers if it is to successfully assimilate the additional staff.

It is now possible to say definitely that, on the average, for every physicist engaged in college teaching in January of this year there must be at least one and one half teachers of physics recruited from other sources. This ratio is based on official information regarding presently available teachers of physics and the number of teachers needed adequately to take care of the urgent demands that will be made by the Army and Navy training programs, as well as what will remain of normal programs. In view of this situation, no institution has a right to recruit teachers of physics from any college which is at all likely to have a training unit or to have a sufficiently large enrolment of women, younger men and physically disqualified men to justify the continuance of the department. If, after the training programs are under way, any institution has a ratio of genuine to "ersatz" teachers of physics higher than one to one and one half, it will find itself open to severe criticism if any of the ex-

perienced teachers have been recruited from institutions needing them.

As a matter of fact, the demand for physicists to engage in war research and various war activities other than teaching continues and as many research physicists as possible should be released from teaching obligations, thus making it all the more important that as many new teachers of physics as possible should be recruited. Even with the recognition by Selective Service of the importance of continuing physics students in training, advanced undergraduate and graduate work will make lighter demands than normal upon staff time except in the small number of institutions where the Army and Navy training programs call for advanced work. Therefore, in many institutions there will be physicists who can serve the war effort better by going into war research than by teaching beginning physics. Such men should be released and are urged to register with the Office of Scientific Personnel.

Several institutions have anticipated this teacher shortage and have canvassed their own faculties and other sources for potential teachers of physics, mathematics and other subjects in which shortages will occur. Some departments of physics have already inaugurated intensive refresher courses in which prospective teachers thoroughly review beginning physics, solve all the problems of the course, and perform the demonstration and laboratory experiments. Even though the new teachers may not be called upon to give demonstration lectures or to teach in the laboratory, this work with equipment furnishes a most effective form of review. It vitalizes and clarifies the "book learning" that might otherwise appear to be sufficient. It also serves to make each teacher familiar with what goes on in the entire course.

Many departments of physics have available some graduate and senior students who can immediately be called upon to serve as teachers. This has been taken into account in the estimates. Most departments, however, will have to meet most or all of the demands for staff expansion by recruitment from the staffs of other departments and outside sources. The sooner this is realized the better, for it is essential that such persons enjoy a period of thorough training.

It is unfortunate indeed that the selection of institutions for Army and Navy training programs is piecemeal. Some of the less well-equipped institutions, from the standpoint of both personnel and facilities, have been announced as on the approved list, while excellent institutions are still quite uncertain where they stand. This situation throws a heavy burden of responsibility upon the administrative officers and staff members of those colleges which are held in suspense. Apparently the Army and the Navy can not be expected to guarantee the use of an institution until a final decision is reached. In the meantime the college will have to depend on any indications that may be given by "approvals for inspection" and the attitude of inspection officers. This means that an institution must be its own judge as to whether or not it should hold its staff together until a "letter of intent" is issued. Unless a nucleus of experienced teachers is maintained, it will be difficult and perhaps impossible to revive a department. In some instances, it may be feasible to release staff members "on loan," subject to recall.

The best information that can be obtained indicates that, except for institutions that can not furnish the necessary housing and messing facilities, all normally good physics departments will be used and there are practically no departments from which teachers should be taken. It is to be hoped that departments fortunate enough to secure early contracts will not yield to the temptation to pirate staff members from other institutions. There is no good department of physics so small that the professor of physics should not attempt to remain at the post to hold things together, with the hope that some sort of training program may be secured or that he can maintain a civilian program of value to the war effort. All the better qualified departments are practically certain to receive contracts of one kind or another.

It is true that there will be a small, legitimate movement of physicists from one teaching position to another and it is to be hoped that readjustments within departments may release a considerable number for war research.

The Office of Scientific Personnel is ready to assist in any changes that will further the war effort and will welcome the registration of available persons, especially those who may be released for war research.

HOMER L. DODGE

DIRECTOR, OFFICE OF
SCIENTIFIC PERSONNEL,
NATIONAL RESEARCH COUNCIL

THE PRODUCTION OF THE MEAT, MILK AND EGGS TO WIN THE WAR AND THE PEACE

MEAT, milk and eggs are among those protective foods which are considered so essential for maintaining the health, stamina and morale of the armed forces and civilian populations of the United Nations. The United States has been called upon to serve as the food arsenal for democracy. While this country is one of the best in the world for livestock production, maximum use is not made of the knowledge developed by the research workers so that production is still somewhat inefficient and much loss occurs. Many of the losses from which the farmer suffers are insidious in nature and resemble more the work of sabotage than the direct annihilative result of warfare.

From the biological point of view it is not sufficient to merely ask for an expansion of production without providing suitable recommendations for handling those problems resulting from increasing the density of the animal population and to make provision for substituting adequate feeds and other products required for the animal population as a result of the changes brought about by the war. Production programs based upon the best existing available knowledge are currently being prepared for the guidance of farmers and breeders under the auspices of the Inter-Association Council on Animal Disease and Production.

This council is composed of the following representatives from the respective national associations: Dr. H. W. Jakeman, *chairman,* American Veterinary Medical Association; Dr. L. E. Card, Poultry Science Association; Dr. W. V. Lambert, American Society of Animal Production; Dr. G. E. Taylor, American Dairy Science Association; Dr. Mark Welsh, United States Live Stock Sanitary Association.

This council was formed as an outgrowth of an informal discussion held by a group of men whose interests were concerned with the activities of the associations mentioned above. The informal discussion was held on April 1, 1942, during the meetings of the Federation of American Societies for Experimental Biology. The scientists attending these meetings were pointing out the great need for improving the diet of the American public, and consequently those at the informal discussions recommended that official representatives be appointed from the associations for the development of coordinated programs, which would advise the farmer on the most practical methods of attaining the food production goals which he had been asked to reach.

Officially appointed representatives held their first meeting on May 11, 1942, in Chicago. They recommended that the Inter-Association Council prepare suitable production programs, utilizing the facts already well established, and that the National Research Council be requested to appoint a Committee on Animal Health for consideration of those critical problems which require further research before they can be suitably handled. Such a committee has been appointed by the National Research Council.

The report of the Inter-Association Council was duly accepted by the various organizations, and the council has proceeded in accordance with its instructions for the preparation of production programs. Outstanding consultants on the various classes of live stock have been appointed, and special programs are expected to be available in the near future. They will consist primarily of a series of recommendations which are designed to enable the farmer and breeder to most effectively produce the livestock and livestock products required of him.

H. W. JAKEMAN,
Chairman

SCIENTIFIC BOOKS

"FAMILY TREASURES"

Family Treasures. By DAVID D. WHITNEY. 299 pp. Illustrated. Jaques Cattell Press. 1942. $3.50.

A BIOLOGICAL teacher and investigator of long-established and high reputation has prepared a popular guide to heredity based upon observation of his own family and that of many of his students. Unlike most books on human genetics, stress is laid on normal, somatic and physiological traits rather than on pathological ones. As is very wise, the book deals prevailingly with facial features, since these are more accessible through photographs in successive generations of the same family.

An outstanding feature of this book in which it differs from all other books on human heredity is the abundance of photographic material secured and published in the 234 illustrations. Particularly striking is the large scale of many of the facial photographs that are reproduced, in many cases somewhat enlarged. This enlargement concentrates attention upon details which would otherwise be overlooked.

The book is also characterized by a comparative absence of quantitative materials such as are provided by careful measurements with various kinds of measuring apparatus. This will be regarded by many as a defect. On the other hand, the work is rendered the more readable by being qualitative rather than quantitative in its descriptions.

From the standpoint of the investigator in human genetics it may be stated that the author stresses too little the complicated inheritance of many human traits. Multiple factors are so widespread that some students have felt that a new approach to inheritance of human traits is best secured through a new quantitative method of approach. But here again the quantitative studies of this nature are decidedly esoteric and far beyond the scope of a book which is "written for amateurs in the study of human heredity and for those who are interested in personal inheritance of family traits." The book is well adapted to dispelling many of the myths surrounding some of the popular oppositions to heredity and it is also well adapted to the stimulation of other students of heredity to make further extensive studies.

For the purpose for which it is designed the book

seems admirably adapted. It is hoped that it will secure the widest possible circulation.

C. B. DAVENPORT

ENTOMOLOGY

General Entomology. By S. W. FROST. 9 × 6 inches. x + 524 pp. Frontis., 406 illus. New York: McGraw-Hill Book Company, Inc. 1942. $4.00.

THIS book, which is a text for elementary college entomology, covers a wide field in a general manner, and stresses the study of insects in their native habitats. Its 23 chapters are devoted to the position of insects in the animal world; the origin and distribution of insects, using Wallace's 1876 figures to show distribution trends; the abundance and reproductive capacity of insects, as indicated by the prolificness of aphids, flies and some scale insects; beneficial and injurious insects, including poisonous ones and those transmitting human diseases; the different orders, with keys for their separation; metamorphosis; immature insects, with special consideration of various types of eggs, nymphs and pupae and their adaptations; insect morphology; color, including color changes, sexual coloration, varietal coloration, insect color perception, photogenic insects, etc.; sonification, using the cicada, crickets and grasshoppers as examples; insect behavior mostly from the view-point of tropotaxes; insect associations, including hibernating, protective, migrating, swarming and sleeping aggregations as well as social aggregations; solitary insects, their food and nesting habits; scavengers, predators and parasites; associations of plants and insects, including mutual associations, adaptations of flowers and insects, and insectivorous plants; leaf-mining insects; leaf-rolling insects; gall insects; boring insects; subterranean insects; aquatic insects; case-making insects; and cessation of activity, including diapause, suppressed development, sleep, death feigning and factors causing the death of insects.

Each chapter, which is a complete essay in itself, is accompanied by a bibliography of the more important papers in that field. In addition there is an appendix consisting of field keys to the immature forms (except eggs and pupae) of the Orders, keys to common groups of Coleopterous and Lepidopterous larvae, a table of the synonymy of Order names, a table showing schemes of the classification of orders from 1735 to 1937 and a summary of the important groups of leaf-mining and subterranean insects. An adequate index ends the volume. The illustrations are numerous and uniformly good.

Because of the enormous field covered by Professor Frost, the discussions are, of necessity, brief. Nevertheless, his summaries are adequate and sound and represent the matured and extensive knowledge of many years of experience and research. In addition, Professor Frost has incorporated in his book various topics not usually found in our text-books, such as Bryson's table for the identification of soil insects by characteristics of their burrows, discussions of the food habits of large groups of insects, of the fecula of insects, of the amounts of foliage consumed by certain species and of other important discoveries by entomologists. These facts, together with his presentation, make this volume an extremely interesting one and an ideal and stimulating introduction of the subject for college students.

HARRY B. WEISS

SPECIAL ARTICLES

CLOSE RELATION BETWEEN RUSSIAN SPRING-SUMMER ENCEPHALITIS AND LOUPING-ILL VIRUSES[1]

IN 1938 Russian scientists isolated and described a virus obtained from the brain tissue of fatal cases of encephalitis occurring in Russian woodsmen.[2] They placed their virus in the St. Louis-Japanese B encephalitis group on the basis of reactions in laboratory animals but then differentiated it sharply from St. Louis and related it slightly to Japanese B virus as a result of immunological tests.

The Russian virus sent to Dr. R. R. Parker in this country[3] was made available to us for study through the agency of the Commission on Neurotropic Virus Diseases of the United States Army and the cooperation of Drs. Dyer, Parker and Cox, of the U. S. Public Health Service.

We have found this strain of Russian virus to be similar to a strain of louping-ill virus, the causative agent of an encephalitis of sheep in Scotland[4] and possibly of Australian X disease of children.[5] The strain of louping-ill virus in our laboratory was obtained from Dr. T. M. Rivers in 1932, shortly after he had received it from Scotland.

Our observations on the Russian virus are briefly

[1] These investigations were aided through the Commission on Neurotropic Virus Diseases, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Division, Office of the Surgeon General, United States Army.

[2] E. N. Levkovich, A. K. Shubladze, M. P. Chumakov and V. D. Soloviev, *Arch. sc. biol.*, 52 (1): 162, 1938; A. A. Smorodintseff, *Arch. ges. Virusforsch.*, 1: 468, 1939–40.

[3] R. R. Parker, *Public Health Rep.*, 57: 1963, 1942.

[4] J. M. Alston and H. J. Gibson, *Brit. Jour. Exp. Path.*, 12: 82, 1931.

[5] J. B. Cleland, *Proc. Roy. Soc. Med.*, 12 (Sec. Path.): 33, 1918–19; A. Breinl, *Med. Jour. Australia*, 4: 454, 1917.

as follows: Rabbits and guinea pigs remained well following intracerebral inoculation with large doses. Mice, however, were highly susceptible to the virus whether injected by intracerebral, intraperitoneal or subcutaneous routes. Lesions in the brains of mice following intracerebral inoculation were similar to those of louping-ill and Japanese B encephalitis. Altogether these findings suggested that the Russian virus might be related to the Japanese B or louping-ill group.[6]

TABLE I

COMPLEMENT-FIXATION TESTS
MOUSE HYPERIMMUNE SERA

Serum	Antigen		
	Russian spring-summer encephalitis	Louping-ill	St. Louis encephalitis
Russian spring-summer encephalitis	1/64*	1/32	0
Louping-ill	1/32	1/64	0
St. Louis encephalitis	0	0	1/64

* Highest dilution of serum giving a 2+ or better fixation. The first dilution of serum was 1:2 in all cases.

Immunological studies comprised complement-fixation and serum-protection tests with hyperimmune and convalescent sera, as well as cross-resistance tests. Complement-fixation tests with hyperimmune sera showed no relation between Russian and any known central nervous system virus except that of louping-ill. In the case of the Russian and louping-ill viruses, however, there was cross-fixation nearly to titre (Table I). Similar crossing was obtained when the antigens were titrated against a constant amount of serum. Serum-neutralization tests with hyperimmune sera showed that the Russian serum, although prepared with difficulty, neutralized Russian and louping-ill viruses equally well, whereas the louping-ill serum, although easily prepared, neutralized the Russian virus only to part titre. Sera from three human convalescents were also tested. The first two cases survived what was presumably a laboratory infection with louping-ill[7] in 1933. The third survived an infection probably also contracted in the laboratory in 1942. Sera from these cases all fixed complement equally well in the presence of Russian or louping-ill antigen (Table II) but neutralized louping-ill somewhat better than Russian virus (Table III).

TABLE II

COMPLEMENT-FIXATION TESTS
HUMAN CONVALESCENT SERA

Serum	Antigen		
	Russian spring-summer encephalitis	Louping-ill	St. Louis encephalitis
Human No. 1	1/8*	1/8	0
Human No. 2	1/8	1/8	0
Human No. 3–I	1/16	1/16	0
Human No. 3–II	1/32	1/32	0

* Highest dilution of serum giving a 2+ or better fixation. The first tube in each case contained undiluted serum.

TABLE III

NEUTRALIZATION TESTS
HUMAN CONVALESCENT SERA

Serum	Neutralization index for:		
	Russian spring-summer encephalitis virus	Louping-ill virus	Japanese B encephalitis virus
Human No. 1	150	1500	−10
Human No. 2	10	500	−20
Human No. 3	150	500	−1
Normal human control	1	1	1

Cross-resistance tests showed that mice vaccinated with non-virulent Russian virus were protected against at least 10,000,000 intraperitoneal lethal doses of Russian virus and 100,000 intraperitoneal lethal doses of louping-ill virus, and that mice vaccinated with non-virulent louping-ill virus were protected against at least 100,000 intraperitoneal lethal doses of both louping-ill and Russian viruses (Table IV).

TABLE IV

CROSS-PROTECTION TEST

MICE VACCINATED WITH EITHER RUSSIAN SPRING-SUMMER ENCEPHALITIS, LOUPING-ILL OR WESTERN EQUINE ENCEPHALOMYELITIS FORMOLIZED, AVIRULENT, MOUSE BRAIN EMULSIONS. TESTED INTRAPERITONEALLY FOR IMMUNITY AGAINST RUSSIAN SPRING-SUMMER ENCEPHALITIS AND LOUPING-ILL VIRUSES

Vaccine (0.25 cc × 2) subcutaneously	Fate of mice following intraperitoneal injection of 0.5 cc of virus in dilutions:															
	Russian spring-summer encephalitis virus									Louping-ill virus						
	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	10^{-9}	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}
Russian spring-summer virus	2/5*	1/5	1/5	0/5	0/5	0/5				3/6	0/5	1/5	0/5	0/5	0/5	
Louping-ill virus	5/5	4/5	2/5	2/5	0/5	0/5	0/5			0/5	0/5	1/5	0/5	0/5	0/5	
Western equine encephalomyelitis virus			5/5	5/5	5/5	5/5	5/5					3/5	5/5	4/5	0/4	
No vaccine—controls			5/5	5/5	5/5	5/5	5/5	5/5	0/5		5/5	4/5	5/5	3/5	3/5	3/5

*2/5 = Two mice out of five died following inoculation.

Because of these findings we regard the specimens

[6] Leslie T. Webster, *Jour. Am. Med. Asn.*, 116: 2840, 1941.

[7] Thomas M. Rivers and Francis F. Schwentker, *Jour. Exp. Med.*, 59: 669, 1934.

of Russian and louping-ill viruses as received in our laboratory as similar. Final proof of the identity of these two agents awaits the testing of fresh specimens of virus obtained from Russia and Scotland. Meanwhile we call attention to the possibility that the tick-borne spring-summer virus encephalitis of man in the timber country of Russia and the tick-borne virus encephalitis of sheep in Scotland may be caused by one and the same infectious agent.

J. CASALS
L. T. WEBSTER

THE LABORATORIES OF THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH, NEW YORK, N. Y.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN INEXPENSIVE DISPOSABLE FILTER FOR BLOOD AND PLASMA TRANSFUSIONS

ACCUMULATION of fibrin and gelatinous material in stored blood and plasma is commonplace despite the use of sufficient sodium citrate solution. The macroparticles become more numerous with increased age of the stored product and are a serious hazard in the administration of blood and plasma.

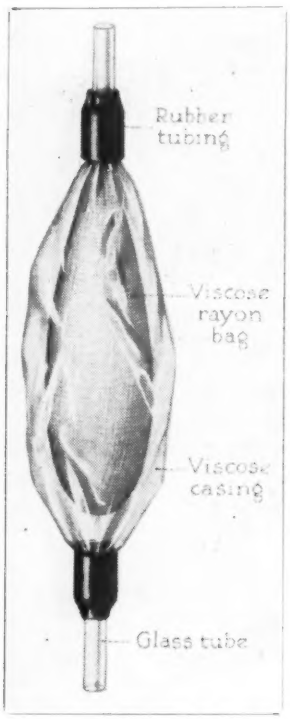

FIG. 1

There is universal agreement among reputable authorities that filtration of blood and plasma must be carried out previous to intravenous administration, and yet an entirely satisfactory filter does not exist. Metal screens in common use are expensive, difficult to clean and are either too coarse to retain the undesirable material or else they are so fine that they become clogged easily. The use of cotton gauze should be condemned, for cotton fibers may be liberated into the filtered product and the open method usually employed allows air contamination with bacteria to take place. Other methods which have been proposed are impractical from the standpoint of breakage and difficulty encountered in cleaning the apparatus.

The essential problem then is the need for a filtering mechanism which will: (1) Yield a filtrate free of fibrin or gelatinous accumulations; (2) not clog or leak while in use; (3) allow continuous filtration during administration of the blood and plasma; (4) allow filtration under aseptic conditions; (5) eliminate the uncertain and laborious cleaning procedures; (6) be relatively inexpensive.

A simple apparatus which fulfils these requirements reasonably well is illustrated in Fig. 1. It consists of a cone-shaped viscose rayon sheer cloth bag made by sewing together two triangular pieces of the material; each piece having a base of 4 inches and an altitude of 8 inches. This allows a large filtering surface and eliminates the possibility of clogging. The bag is attached to a short glass tube by means of a $\frac{1}{2}$-inch piece of rubber tubing and then enclosed in an 8-inch length of $1\frac{3}{8}$-inch viscose sausage casing. The casing is gathered at either end around glass tubing and attached by means of $\frac{3}{4}$-inch pieces of rubber tubing which act as tight-fitting rubber bands. The apparatus may be wrapped separately and autoclaved or attached directly to the transfusion set just above a Murphy drip and sterilized with the set.

Chief advantages of the filter are its efficient and rapid filtering action without clogging made possible by the large filtering area. It does not leak. Its construction is simple and inexpensive so that it need be used but once and then discarded. Its lightness, compactness and disposability are features especially suitable to military conditions.

The cost of labor and materials required to make an entirely new filter for each transfusion is less than the cost of labor and breakage involved in cleaning the metal or glass filters now in common use. The problem of reactions attributed to unclean filters is eliminated. In actual use at the Research and Educational Hospitals of the University of Illinois it is preferred to other types of filters.

MILAN NOVAK

COLLEGES OF MEDICINE, DENTISTRY AND PHARMACY, UNIVERSITY OF ILLINOIS, CHICAGO

BOOKS RECEIVED

DACK, G. M. *Food Poisoning.* Pp. xi + 138. University of Chicago Press. $2.00.

LUSH, JAY L. *Animal Breeding Plans.* Illustrated. Pp. viii + 437. The Iowa State College Press. $3.50.

MORGAN, W. W., PHILIP C. KEENAN and EDITH KELLMAN. *An Atlas of Stellar Spectra.* With an Outline of Spectral Classification. Illustrated. Pp. 35. 55 Plates. University of Chicago Press. $10.00.

ST. JOHN, ANCEL and HERBERT R. ISENBURGER. *Industrial Radiology.* Illustrated. Pp. ix + 298. John Wiley. $4.00.

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By ARTHUR R. NILSON, Nilson Radio School, New York, N. Y., and J. L. HORNUNG, formerly of New York University. Second edition. Textbook edition, in press, $5.00

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By P. C. SANDRETTO, Major, Directorate of Communications of the U. S. Army Air Forces. 414 pages, 6 x 9, $3.50

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By HERBERT J. REICH. 398 pages, 6 x 9, $3.50

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By FREDERICK E. TERMAN, Radio Research Laboratory, Harvard University, on leave from Stanford University. Second edition. 813 pages, 6 x 9, $5.50

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Africa may become one of the larders for an impoverished Europe.

LEND-LEASE TO CHINA AND INDIA

LEND-LEASE is working both ways in equipping American, British and other Allied armed forces in India and China. The great natural resources of India are being converted into fighting equipment and accessories with machinery, instruments, drugs, chemicals and other essentials from America.

Textile machines sent from America are weaving cloth for uniforms, blankets and tents for Allied troops. American sawmills, shipped and reassembled, are cutting lumber for army uses. American-built locomotives are moving Indian products to army camps. A single boatload of sawmill machinery will manufacture as much material in a year as could be brought over the same route by the same boat in five years. Lend-lease with India is paying its way.

Lend-lease aid to India now amounts to some $300,000,000. Two thirds of this was for finished munitions, tanks and other vehicles. One third was for machinery and tools with which India will soon be producing finished products of the kinds shipped from America at the beginning of the program.

A considerable amount of American steel has been sent to India. But India is the second largest producer of iron ore in the British Empire. Machinery sent to India will greatly expand to present activities in steel manufacturing to meet all fighting and civilian needs. Manganese and molybdenum will still be sent, as no local supply is available, and without them India can not make steel.

India has 40,000 miles of railroad, a mileage exceeded only in the United States, Canada and Russia. But it is badly in need of rolling stock, particularly locomotives, and of wheels, boiler tubes, axles, and signal and telegraphic equipment. Much of these can be turned out in India if the needed machinery is supplied.

Approximately 400 textile mills in India, weaving textiles for the use of the Allied forces, are using native cotton and other fiber. This is lend-lease in reverse without a dollar of American money being paid for the finished product. Twenty projects for the manufacture of munitions have been started with machinery and supplies sent from this country. Soon most if not all the munitions needed by the Allied armies will be available without the thousands of miles of water transportation now necessary.

A recent report of an investigator of the Office of Lend-Lease Administration who visited India late in 1942 says that country can produce supplies for the entire Burma-China-India front if properly developed. It has the needed manpower and much of the raw material. It lacks machinery and skills. America and England are helping to supply both.

ITEMS

THE weather, abnormally cold two weeks ago, reacted to the opposite extreme last week, according to the seven-day survey of the U. S. Weather Bureau. Over most the country, temperatures have ranged well above normal from the season. Highest "plus departures" were in the region between the upper Mississippi and the Rockies, reaching 12 to 20 degrees Fahrenheit above normal. Despite high temperatures and continued fair weather, however, fields in the great interior valley are proving slow about drying out. For the most part, the soil is too wet for early farm work.

WINTER, which has just ended according to the weatherman's reckoning, was near average in temperatures in the eastern half of the country, somewhat warmer than average in the West, according to data compiled by the U. S. Weather Bureau. To be accurate, it was a little colder than average east of the Plains region, but only a little—two degrees Fahrenheit or less. Western temperatures averaged from four to six degrees above normal. The Weather Bureau notes a marked contrast to last winter, which was abnormally warm in the northeastern quarter of the country and relatively cold in the South. The past week's weather is another record of ups and downs, with warm weather succeeded by another cold wave, which wrought additional damage to the truck-growing regions in the South.

EXCELLENT clinical results in the treatment of empyema (a serious chest infection) have been achieved by a combination of the disinfectant azochloramid, and the synthetic wetting agent, sodium tetradecyl sulfate, was reported by Dr. Orville Wyss, of Wallace and Tiernan Products, at a meeting of the New York Bacteriologists' War Research Projects Group. Synthetic wetting agents or detergents are generally known to the layman as soap substitutes. Their effectiveness against bacteria, or germs, is due to their property of concentrating around the bacterial cells and bringing about a disturbance of the electric charge distribution on the cell wall. This disastrously upsets the vital chemical processes of the germs. The wetting, penetrating and pus-dispersing properties of these soap substitutes or synthetic detergents can be used in the treatment of infected wounds by combining them with antiseptics.

ELECTRIC power lines can be boosted more than two thirds in capacity by adding small steel boxes crammed with sheets of aluminum and paper, is indicated by experiments conducted by R. D. Evans, Westinghouse consulting transmission engineer. A miniature power system was set up to simulate the power demands of a typical community. The small steel boxes, called capacitors, were installed to increase current-carrying capacity and meters checked the results. From the experimental work, Mr. Evans estimates that a regular 250-mile power line of 175,000 watts would supply enough extra power to supply a city of 350,000 population if 7,200 of the capacitors were added, together with necessary generating equipment. About $3,300,000 would be saved as compared with the cost of the usual method of installing additional transmission wires. Several thousand tons of copper and steel would also be saved by this method.

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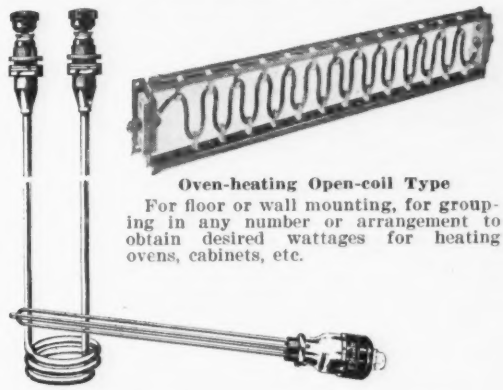

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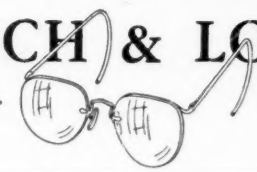

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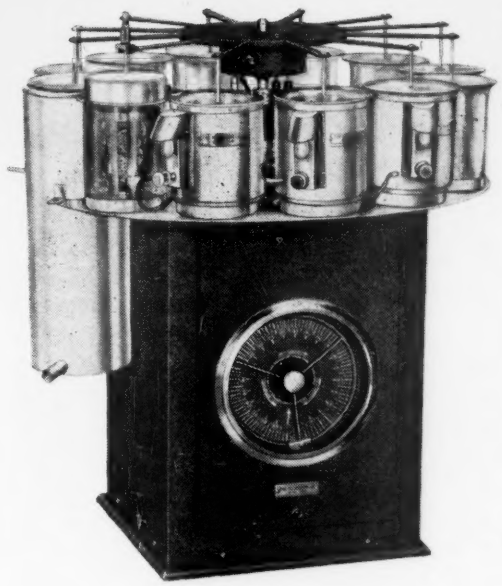

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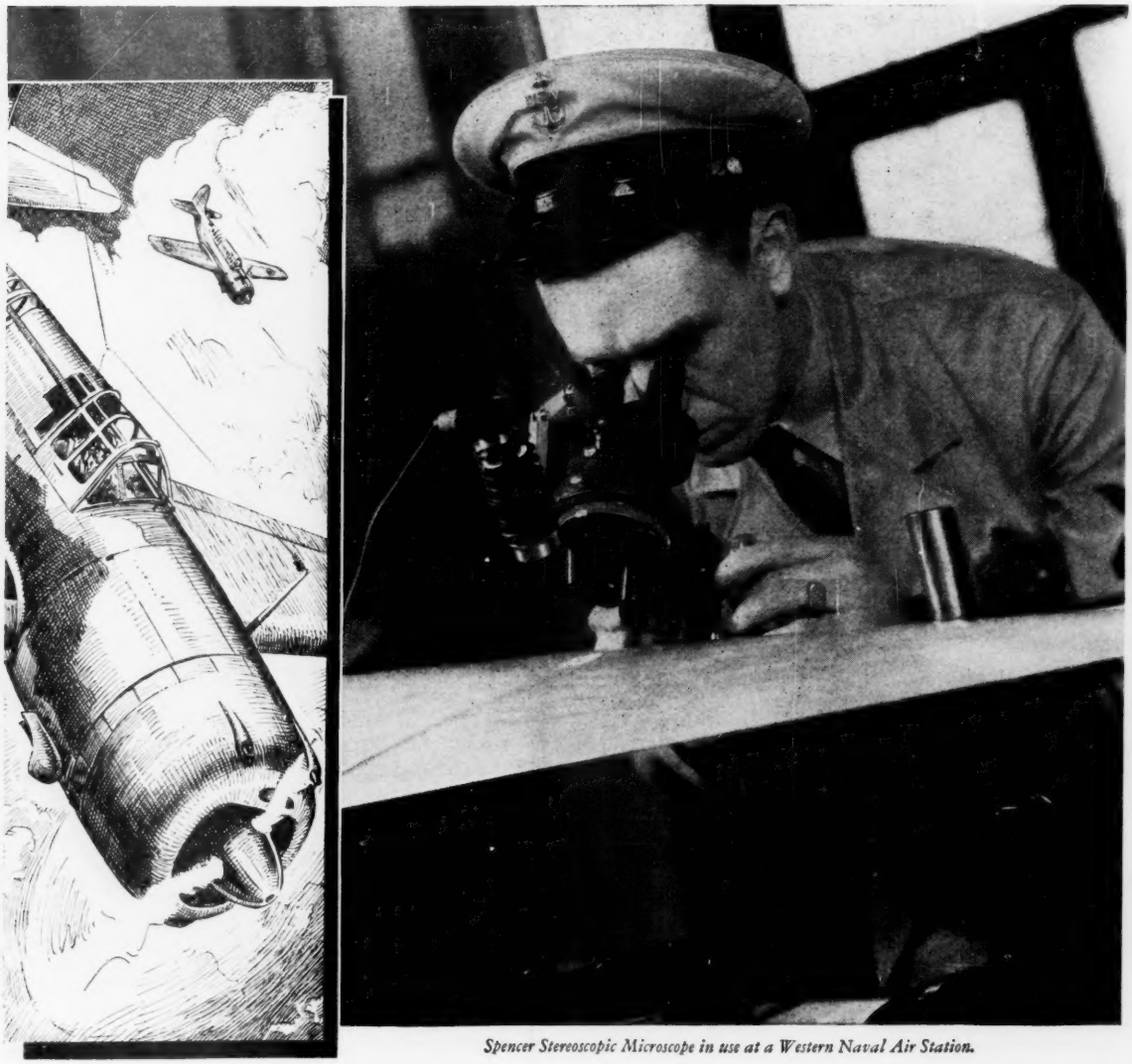

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